

# A Comprehensive Analysis of COVID-19 Outbreak circumstance in India

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**Abstract-** The flare-up of COVID-19 in various pieces of the world is a significant worry for all the regulatory units of particular nations. India is likewise confronting this exceptionally intense errand for controlling the infection episode and has dealt with its development rate through some exacting measures. This investigation presents the present circumstance of coronavirus spread in India alongside the effect of different estimates taken for it. With the assistance of information sources (till seventh eighth April 2020) from different state units of India and Ministry of Health and Family Welfare, Government of India, this investigation presents different patterns and examples. This investigation answers six distinctive research questions in a far reaching way. It has been accounted for that development pace of contaminated cases has been controlled with the assistance of National Lockdown, anyway some uncontrolled mass level occasions had adversely affected the tainted cases. With the assistance of exponential and polynomial relapse displaying, the forecasts of up to 75000 cases have been finished before the finish of April 2020. It has additionally been seen that there are some noticeable bunches and patient hubs in the system of patients which are the significant influencers for COVID-19 spread.

Likewise, demise rate case forecasts have been done through two-class characterization models with an exactness of 60%. Toward the end, procedures for continuation for lockdown has been examined and present-ed. It creates the impression that lone basic administrations ought to be open for the residents of India and the national lockdown ought to be carried on for next 2 a month. This examination will be helpful for the Government of India and different conditions of India, Administrative Units of India, Frontline wellbeing workforce of India, analysts and researchers. This examination will likewise be great for the regulatory units of different nations to consider different viewpoints identified with the control of COVID-19 extended in their particular locales.

**Index terms-** Novel Corona Virus, India, Patients Analysis, Data Science, Data Analysis, Pre-phrasings,

**Trend Analysis, Forecasting, Data Mining, Network Analysis, Pattern Mining, Rule Mining, Classification, Cluster Analysis, Lockdown, Social Distancing, Degree Centrality**

## PRESENTATION

COVID, at least 19 prominently known as Novel Corona Virus, is related with the respiratory clutter in people which has been pronounced as a worldwide pestilence and pandemic in the primary quarter of the year 2020 by the World Health Organization [1]. According to the most recent information (sixth April 2020) by John Hopkins University [2] and other following sites, there are as of now more than 1.3 million individuals contaminated by the Novel Corona Virus all around the globe and near 75 thousand passing detailed from various pieces of the world. The main 10 nations with most extreme number of tainted cases are the United States of America, Spain, Italy, Germany, France, China, Iran, United Kingdom, Turkey and Switzerland. The top nations with most extreme number of announced passing are Italy, Spain, United States of America, France and United Kingdom. As for the recuperated patients list, China is at the highest priority on the rundown followed by Spain, Germany, Italy, Iran and the United States of America. India was put serenely out the rundown of contaminated countries by gigantic edges, yet ongoing occasions prompted its ascent to 27th position which is a state of concern. The death rate is controlled at under 3% at the present time, which is better than the ~5.5% death pace of world, yet the model of spread is gradually moving towards an exponential pattern which can prompt gigantic loss of lives and infrastructure. India is being viewed by different countries now as a World Leader and even WHO recognized that world is looking towards Indian techniques to contain the flare-up of this pandemic [3]. India represents just about one-fifth of the total populace and is second

leading nation as far as populace on the planet. India contributes vigorously to the world's GDP and is among the most conspicuous creating nation on the planet with genuinely solid economic development rates [4]. India's acceptable kinship with greater part of the countries on the planet and its supportive nature makes it an ideal partner for different nations. Thusly, the investigation of COVID-19 flare-up in Indian district is firmly watched and checked by the World and there is a need of exhaustive expository examinations dependent on various techniques taken by Indian directors every now and then. India has been following an across the country lockdown since 22-March-2020, which was a one-day lockdown, trailed by a 21-day lockdown following two days. Each action in India from that point forward has been going on with authorization from different advertisement ministration units and practically all the household and worldwide voyages have been either restricted or observed intently. India is yet to get into the third period of COVID-19 episode for example the network episode as observed by different nations around the globe, yet the cases have been rising ceaselessly. India's lockdown period has been affected by two significant occasions in the ongoing days which were identified with the mass migration of workers and laborers from one state to different states (particularly from Delhi to neighboring states) and conduction of a strict occasion in Delhi which prompted spike in the quantity of cases in different conditions of India. During this time, the Indian Prime Minister has been attempting to associate with Indian residents through innovative systems and thinking of different commitment exercises which are affecting the entire country. With such a great amount of occurring in India at the present time, it becomes basic that we study the present circumstance and effect of different such occasions in India through information investigation strategies and concoct various designs for future which can be useful for the Indian advertisement ministrations and clinical experts.

The present investigation investigates different angles related with the COVID-19 episode India and the different districts arranged in India. The particular research questions (RQ) investigated in this examination is as per the following.

- RQ1: How has the circumstance changed in post-lockdown period in India for example what

is the episode circumstance after 22-March-2020 in India when contrasted with pre-lockdown period?

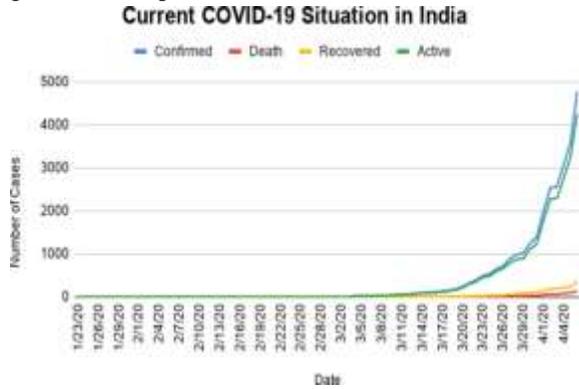
- RQ2: What are the short terms forecasts for the quantity of tainted cases in India for the following 3 a month dependent on current circumstance?
- RQ3: Has the lockdown been trailed by the Indian residents after 22-March-2020? Has the Social Distancing worked for Indian residents? What are the versatility changes in the different districts of India?
- RQ4: Whether the network episode spread began in India with the direct of a strict occasion in Delhi? How is the episode diverse for residents identified with occasion and for residents not identified with the occasion?
- RQ5: Which are the unmistakable bunches which were shaped over the most recent couple of weeks as for COVID-19 flare-up in India? Does Network Analysis give compelling focuses in the influenced tolerant system?

The present examination is isolated into five areas. First area has laid the setting of the examination. The subsequent segment talks about different writing audit and systematic procedures followed by the various analysts over the world. The third segment presents the methodology and research factors of the investigation. The fourth segment presents the outcomes and discoveries of the examination alongside the conversation of the accomplishment of the different research addresses explored in this investigation. Lastly segment five finishes up this investigation and present restrictions and future bearings for this examination work.

#### IMPACT OF LOCKDOWN ON INFECTED CASES

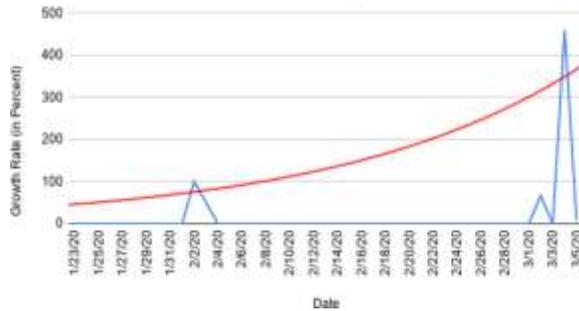
The national lockdown for one day was announced on 22nd March 2020 by the central government of India, before which majority of the schools, colleges, markets, cinema halls, etc. were already shut down by respective state governments. Merely, two days after this one day curfew, a 21-day lockdown was announced by the central government banning all the movement and restricting the Indians to stay at home. The citizens were allowed to step out only in emergency situations and that too with prior

permissions from the local administration. All these instructions were given in the hope of flattening the curve of infected cases and to restrict the exponential growth of the patients in India.



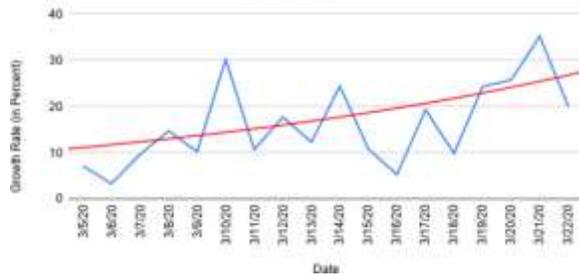
There are almost 5000 confirmed cases reported in India as on the morning of 7th April 2020 with more than 90% cases being active. The death rate has been keeping under 3% at all the stages of the COVID-19 spread. Looking at the graph in Figure 2, it is clearly evident that a spike has been reported in India after 22nd March 2020 i.e. the time when lockdown was announced. It clearly shows that Indian authorities were quick enough to sense the spread rate in Indian region and taking necessary steps of maintaining social distancing by announcing a rigid step of lockdown.

Growth rate of COVID-19 in India from [22-Jan-2020 : 5-March-2020]

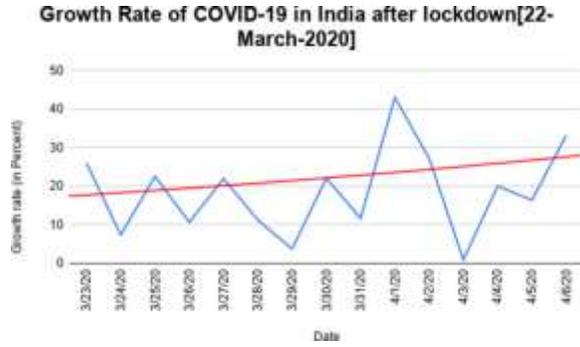


(a)

Growth rate of COVID-19 in India from [5-March-2020 : 22-March-2020]



(b)



Looking at the growth rate of infected cases on daily basis (blue line) and the trend line of expected growth (red line) in Figure 3, it appears that in early days of infection the growth rate was quite high due to low number of cases. The growth rate has been calculated as the difference in number of cases between two consecutive days divided by the count of infected cases on the previous day of the two days under consideration multiplied by 100. Since, in the early days the count was in single digits, so the growth rate was pretty high. Hence ignoring that period, considering the second phase of time period from 5th March to 22nd March 2020

i.e. exactly before the lockdown, the growth rate has been hovering around 20% with trend line forecasting it to be maximum around 28%. However, for the time period after lockdown

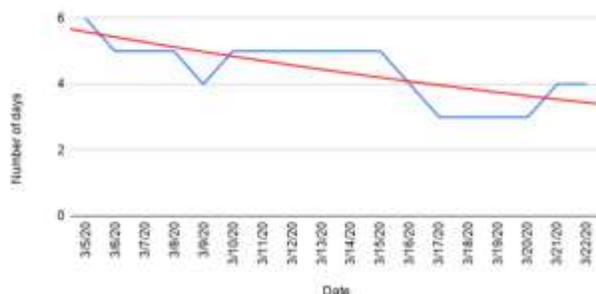
i.e. from 22nd March 2020 onwards, the growth rate slightly increased, but it remained around a similar mark of 20%. And the trend line also predicted the growth rate on per day basis to be around maximum of 28%. Therefore, it can be said that the national lockdown has been able to contain the growth of the number of cases of COVID-19 patients. Without lockdown, the growth might not have been contained in India and may have gone into the exponential zone too quickly. This gives all the state level and national level administrators and health workers to get prepared for the rising number of cases.

### SHORT TERM PREDICTIONS FOR INFECTED CASES

Exponential Modeling has been used to predict short term predictions at national level. First, the growth for doubling days was calculated, i.e. the number of days to double the number of infected cases have been calculated. As seen from Figure 4, the first image shows that prior to the lockdown period

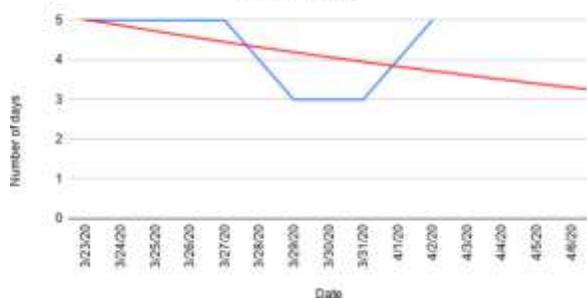
average number of days to double the cases was majorly above four, while the average period drop down near to three after lockdown. As per the predictions (trend line in red) the average number of days is constantly decreasing when the number of cases is rising in India.

**Doubling rate of COVID-19 in India from 5-March-2020 : 22-March-2020**



(a)

**Doubling rate of COVID-19 in India after lockdown [22-March-2020]**



(b)

Based on the exponential model, the predictions for the next 3 weeks were made for the infected cases in India. Considering that doubling rate is going as per the historical evidences, the number of predicted cases in India is shown in Table 1. Based on the exponential model- ling based growth of the number of COVID-19 cases in India, polynomial regression line was plotted with different degree values. A total of 5 degrees were checked between 2 to 6 and Root Mean Error (RME) was checked for all cases. The lowest RME reported was 237.58 for the model with degree 4. Thereafter, the prediction model of polynomial regression of degree 4 was built and used for the prediction values. For training set, data for 31 days was considered starting from 3-March-2020 to 3-April-2020. This was due to the fact that prior to 3rd March, only 5 cases were reported in Indi within 40 days which was impacting the prediction model. For evaluation, data from a short time period of 4-April-2020 to 7-April-2020 was used. Other train and test sets were also considered and predictions were

similar. With these prediction values, it is estimated that the values for infected cases may rise near to 75,000 in India which may not be a really good situation in India.

Date	Predicted Number of Infected Cases
4/07/2020	5245
4/08/2020	6111
4/09/2020	7088
4/10/2020	8187
4/11/2020	9416
4/12/2020	10786
4/13/2020	12308
4/14/2020	13993
4/15/2020	15851
4/16/2020	17895
4/17/2020	20137
4/18/2020	22589
4/19/2020	25264
4/20/2020	28175
4/21/2020	31336
4/22/2020	34761
4/23/2020	38464
4/24/2020	42460
4/25/2020	46763
4/26/2020	51391
4/27/2020	56358
4/28/2020	61680
4/29/2020	67375
4/30/2020	73458
5/01/2020	79949
5/02/2020	86864

**WRITING REVIEW**

According to various papers accessible in writing, there are a couple of studies that emphasis on the pattern investigation and estimating for Indian area. The examinations [5][6] on Indian area presents long haul and momentary pattern, individually. These investigations use time arrangement information from John Hopkins University database and present estimating utilizing ARIMA model, Exponential Smoothing strategies, SEIR model and Regression Model. Anyway organize demonstrating and design mining are not endeavored in these forms of the examinations and that too at the local level, thus the present investigation endeavors to do that. Likewise, the investigations in Indian district from the past are progressively centered around introducing time arrangement examination dependent on the general

information for Indian locale instead of covering different wellsprings of data separated from simply thinking about the quantity of tainted patients, so the need to break down the patients foundation and data is required for the specialists to show signs of improvement understanding about the circumstance.

So also, there are other scientific models that were created for investigating the patterns of COVID-19 flare-up in India. A model [7] for considering the effect of social distancing on age and sexual orientation of the patients in India was introduced. It thought about the nation demographics among India, Italy and China and proposed the most powerless age classifications and sexual orientation bunches among all the countries. The examination additionally anticipated the ascent of contaminated cases in India with various lockdown periods. Correspondingly, a system structure approach was utilized by one of the investigation [8] to see whether a particular hub bunches were getting shaped. In any case, just travel information hubs were considered by the creators to check which the noticeable areas are affecting Indian voyagers returning to the India. Additionally, the examination introduced the SIR model to see the pace of spread of the Corona Virus among patients in India. Investigation on the testing labs and framework was additionally introduced by before creators

#### CONCLUSION

Work of clinical specialists and cutting edge wellbeing laborers was likewise introduced by certain examinations [9]. It was discovered that in India, the job of wellbeing laborers was less worried as the spread phase of crown infection was still in stage two or the period of neighborhood transmission as opposed to the community

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